STRUCTURAL PLAN REVIEW GUIDELINES

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I. Plan Review Procedure

1. Overview

The Division of the State Architect (DSA) Plan Review Engineer (PRE) is responsible to assure that the drawings and specifications comply with codes and regulations, and represent structurally stable construction under all loading conditions through an efficient and timely plan review and back review process. Final drawings should depict constructible construction.

2. Objectives

The PRE shall:

- Be thoroughly familiar with the current applicable codes, policies, industry standards, product acceptances, and DSA Interpretations of Regulations.
- Use the Structural Plan Review Guidelines for Schools (this document) and the Structural Plan Review Reminder List to implement a systematic approach to the plan review

3. Project Submittal

A complete description of the project submittal process is provided on the DSA website. The Application for Approval of Plans and Specifications (Form DSA-1), plan review fees, stamped and signed plans and specifications, a 'Project Tracking Number,' and other documents are submitted to DSA at one of four regional offices. Upon receipt, a DSA application number is assigned to the project for tracking purposes. The Project Submittal Checklist provides a comprehensive list of documents required to be submitted to DSA. All required documents must be complete at the time of submittal.

A project submittal specialist performs a preliminary review for completeness within a few days. If a project is determined to be incomplete the architect or engineer in general responsible charge of the project and the school district are notified by letter. Plan review is scheduled after DSA verifies that a complete submittal has been received.

Upon acceptance a project is assigned to a PRE. Before commencing a detailed plan review the PRE shall:

- Make a preliminary review to become familiar with the overall project
- Verify receipt of specifications, soil reports, and geo-hazard report if required. New sites require a geo-hazard report as per T24 Part 1, section 317(e). Additions or alterations to existing DSA approved sites require a geo-hazard statement to be signed such as the one that is printed on the project application Form DSA-1. If any of these required documents are missing,

contact the DSA plan review supervisor. Plan review may be delayed if required documents are missing.

- Confirm that the drawings are complete enough to perform a plan review
- Confirm that calculations are complete enough to perform a plan review. Title 24, Part 1, Section 4-317 (d) states that "the calculations shall be sufficiently complete to establish that the structure will resist the loads and forces prescribed in Part 2, Title 24, the California Building Code (CBC)." There should be no major discrepancies or errors such as incorrect seismic factors, wrong wind load design, incorrect snow loading, etc. Consult with DSA plan review supervisor if there are any deficiencies in the project, which could prevent continuing the plan review.

4. Structural Plan Review

Methodology and plan review comments

There are many methods, which may work in organizing the progress of a plan review. The reviewer may devote the initial time in the plan review to developing an understanding of the working drawings and expected behavior of the structure; then proceed to the technical review of the structural analysis. There may be a series of required plan check comments related to incomplete detailing, such as a missing load path, prior to any review of the structural calculations. The PRE could also proceed sequentially through the Structural Plan Review Reminder List. Ultimately, the PRE needs to check the professional's design calculations against the drawings.

It is important to use your structural engineering expertise to look for aspects of the design that may be missing from the drawings. It is recommended that the reviewer take a moment now and then to 'step back' from detailed review of the details and calculations that have been provided and think about what issues may be entirely missing from the documents. Reduction factors may be missing from the calculations, connection details may be missing from the drawings, and/or entire systems may have been overlooked in the design of the project. For example, overhangs and parapets may significantly increase the wind load on a building or significant mechanical equipment weight on a lightweight canopy structure may dramatically increase the seismic load for which the canopy must be designed. Another example, tie beams for cast-in-place pier foundations may be required. Following the designers path and verifying that calculations and details provided are correct may lead the plan reviewer to overlook the plan reviewer to overlook the same aspects that the designer has overlooked. Use your own judgment, and independent paths of reasoning to verify the conclusion of the designer whenever possible.

Making Comments

- Use yellow pencil to mark items found to be in compliance
- Use red pencil to mark corrections to be made, errors, or omissions found on drawings and in specifications
- Place a tag on specification pages which receive comments
- Place red check mark on lower right hand corner of sheets that have red marks
- Place a yellow mark in the lower right hand corner of each sheet to indicate completed review of that sheet.
- The PRE should not specify any size of members, materials, details, or methods of construction in the comments, nor should design calculations be provided for the design professional

The design professional is required to determine the remedy for any deficiency that may have been discovered by the PRE. Comments should be clear and legible and easily understood so that the designer, at a remote location to the PRE, can make a proper interpretation and correction. Make no editorial comments. Sarcasm or disparagement is unacceptable.

Examples of comment wording:

- Use specific comments such as

  "Show complete details in accordance with your CALC. F-67"

- Do not use vague comments such as

  "Clarify welding"

- Avoid personalized wording such as

  "Your calc for this connection is in error"

- Provide code references for comments whenever possible

  "Provide additional lath support at horizontal soffits per CBC, Section 2506A.5"

- A general comment which applies to numerous sheets of drawings should be worded such that the comment doesn't need to be repeated on each drawing if possible
- Where the same specific comment occurs at many different details, they should each be identified, either by marking up each detail, or by using a standard numbered list of comments with the comment numbers referenced at each detail

- Use 'paste-on' notes where applicable to save time and to maintain uniformity of comments
- Avoid correcting spelling or grammar unless the meaning is not clear

- The PRE will determine correct section modulus (S) when design professional has used the wrong S for determining the stress in a steel beam. If the beam is overstressed, the PRE should write a comment on the sheet where the overstressed beam is shown:

  "W18 x 36 overstressed. Recheck S used in calculation-see AISC page…. and your calc, sheet F-19"

- The PRE can make independent calculations when portions of the design professional's calculations are difficult to follow or interpret.

  "Shear wall is overstressed along gridline A, wall shears are 520#/ft by independent calculation"

- If the PRE does extensive independent calculations, then he/she must number the calculations in sequence and mark the calculation page number on the comment to facilitate the back check.

  "Composite beam overstressed, recheck method of design per AISC requirements N-1" (N-1 is PRE's calculation page number)

Using standards, charts, computer programs, and spreadsheets as checking aids is encouraged. Aids may be derived from in-house, personal, and industry standards. Typical details on the drawings that are not used, and are in conflict with DSA requirements, should be deleted from the drawings or corrected by the designer.

Computer Calculations

- A user's guide must be on file with DSA or must be submitted with computer calculations
- Verify all input – orientation, loading, member sizes, dimensions, etc
- The PRE should make every effort to verify submitted computer calculations whenever possible without running another program.

Computer outputs may be spot-checked by some simplified assumptions such as summation of forces or by some "ballpark" assumptions such as using portal or cantilever methods to check frames.

The PRE may run an independent computer analysis when the design professional's user's guide or input is disputed or cannot be followed logically. Discuss with the DSA plan review supervisor before commencing any extensive computer runs.

Requests for additional calculations

All major structural portions of the project must be substantiated by calculations as per Title 24, Part 1, Section 4-317(d). Example:

"Provide complete calculations for bearing stresses and reinforcement requirements for column footings along gridline B"

A complete calculation would include checking punching shear in the concrete, bearing and bending stresses on the base plate, soil bearing stresses, required reinforcement in the footing, required embedment lengths, footing depths, etc… The DSA reviewing engineer should not be required to make calculations to verify the footing design.

Additional calculations should not be requested for items where the capacity can be easily assessed or interpolated from similar conditions, or is adequate by observation. As a basic rule, do not request additional calculations unless you have determined that the design is questionable. Engineering judgment should be used before asking for additional calculations.

- When additional calculations are required, the PRE may request that they be submitted before back-check allowing sufficient time for checking
- The client's calculations should be separate from the plans since DSA doesn't approve the calculations

5. Architectural Plan Review

The architectural drawings are to be reviewed for the following conditions:

- Loads imposed on the structure due to dead load (DL), fixed equipment, storage, and required live load (LL) as compared with structural assumptions
- Adequacy of non-structural components and their connections to resist vertical and lateral loads
- Architectural details that are in serious conflict with structural details
- Wood protection against moisture, decay, and termites
- Roof drainage per CBC requirements

6. Mechanical, Plumbing, and Electrical Plan Check

Mechanical, plumbing, and electrical drawings are to be reviewed for the following conditions:

- Equipment, piping, or conduit loads imposed on the structure
- Penetration of the structure by piping, ducting, conduit, or electrical panels
- Complete details of anchorage systems for equipment shall be provided on the drawings and justified by design calculations
- Design calculations are not required for equipment weighing less than 400 pounds unless equipment is of unusual configuration (see Title 24, Part 1, Section 4-317(b)1A).
- Spring vibration isolators shall have Office of Statewide Health Planning and Development (OSHPD) pre-approval

  When such systems are utilized, the particular catalog number of the required anchor and the catalog edition date are to be shown. Merely citing the OSHPD preapproval number is not acceptable
- Details of connections to structure will be shown on drawings
- Support and bracing of pipes and conduits
- Fire sprinkler bracing layout follows National Fire Protection Agency (NFPA) requirements for pipes and conduits in school projects
- Bracing connections to structure may follow Sheet Metal and Air Conditioning Contractors National Association (SMACNA) guidelines
- Check for vertical load support and connections to structure, particularly at wood trusses with laminated wood chords, and at steel decks
- Allow for sufficient movement at seismic separations
- Details of kitchen equipment anchorage must be shown on the plans

7. Specifications Check

Specifications may either be in a separate book or in notes on the drawings. The general conditions and supplementary conditions shall indicate that:

- A copy of Title 24 Parts 1,2,3,4, and 5 shall be kept on-site during construction
- Required work shall be performed according to Title 24
- The Owner, not the contractor will employ testing laboratories and inspectors
- No changes may be made to approved documents without DSA approval

- Where standard “boiler plate” specification format is used, conditions in conflict with DSA requirements may be resolved by adding to or amending supplemental general conditions
- Other sections of the specifications shall indicate that materials are per required codes and industry standards such as A-36 for structural steel and ASTM number for cement
- Testing and inspection requirements shall be described in detail. Reference to sections of Titles 24 alone is inadequate
- Proper execution requirements are achieved such as “fully vibrate concrete, maximum grout lift for concrete block, etc.”

The PRE shall verify that project drawing general notes and specifications do not conflict. Specifications usually state that they take precedence over the drawings. Verify that specification items do not adversely affect conditions and details shown on the drawings.

8. Deferred Approvals

The use of deferred approvals shall be kept to a minimum. A deferred approval is not permitted for building elements required for the structural stability of the vertical or lateral load resisting system. The drawings or specifications establish the loading and performance criteria for each deferred item as outlined in Title 24, Part 1, 4-318 (g).

- Special DSA deferred approval note must appear on first sheet of drawings, where deferred item is shown on the drawings, and mentioned in the specifications
- List on the yellow plan review worksheet

9. Test and Inspections List (T & I List)

The tests and inspections list is a summary of all tests. The architect or structural engineer is responsible for distribution of the approved list to the testing laboratory, the job inspector, and the contractor. The PRE obtains an approved copy for distribution to the DSA file and DSA District Structural Engineer.

- Fill out a draft T&I list from information obtained from drawings and specifications
- Note unusual tests and inspections on the T&I list such as tension testing for concrete expansion bolts
- Mark “tentative” in the upper right hand corner
- Hold test list for comparison with structural engineer’s submittal at back-check

- Flag items that may be adjusted at back-check
- Note on check set of drawings that the design professional must submit test and inspection list at back-check

At back-check, the design professional and DSA PRE compare lists and resolve differences. The design professional must submit a signed final copy of the test and inspection list to DSA at back-check. PRE should initial, date, and write "FINAL" in the upper right hand corner of the final copy.

10. Documents Required List

The documents required list is a list of documents required to be submitted to DSA by the owner, contractor, design professionals, inspectors, and test laboratories just before, during, and at the completion of construction. The PRE will fill out a copy of documents required list from drawings and specifications flagging items that may have to be adjusted at back-check. This "preliminary" list can be taped to the plans for review by the design professionals.

At back-check a completed list must be signed by the design professional and put in the project files. The design professional shall retain a copy to be used to facilitate timely submittals of required documents. The PRE will initial and date final approved copy. The PRE will verify and, if necessary, add FLS and ACS deferred approval items to the "Documents Required List."

11. Plan Check Worksheet

Worksheet

- The worksheet will be completed from application, drawings, and specifications
- Flag items that may have to be adjusted at back-check
- Verification of the scope of the work is the PRE's responsibility

Verification of the scope must be determined from drawings and specifications, not the application. Where the scope of work must be revised, mark in the appropriate section of the worksheet and place a note on first sheet of drawings informing the architect.

Scope Memo

12. Turn in Completely Checked Project

Present all project material to the DSA plan review supervisor .The DSA plan review supervisor may return to the PRE all checking material to be retained by him until completion of back-check. The plan reviewer shall mark the cover sheet of the plans with his/her phone number stating that the architect should call to schedule a backcheck appointment.

II. Recheck

In the event that a major design error is discovered by the PRE after the checking is well underway, and this error will result in major redesign, plan checking will be suspended. Immediately consult with the DSA plan review supervisor if such a condition is discovered. Checking will be resumed when DSA receives a recheck set showing the redesign project from the design professional.

- This procedure is to be used only under the special circumstances noted above
- The DSA plan review supervisor's approval must be obtained before requesting a recheck set of drawings.

Also, if the comments are extensive, it may be necessary to inform a client that the projects must be resubmitted a certain time period prior to the back check appointment. The establishment of this time frame should be made with due consultation with the DSA plan review supervisor.

III. Back Check Procedure

1. Scheduling

- The design professionals are required to call the plan reviewer in advance to make an appointment for back-check
- The plan reviewer should coordinate appointments with the FLS and ACS checkers
- Back-check appointments have priority over plan checking

2. Location

- Back-check will normally be conducted in the back-check room of the DSA office where the plans were filed
- Back-checks at other locations or at an alternate DSA area office may be arranged if approved by the DSA plan review supervisor

3. Backcheck Materials

The design professional or a competent employee representative of the design professional authorized to make changes to the drawings and specifications must:

- Complete corrections to drawings, calculations, and specifications before back-check
- Original DSA approved building drawings as requested for verification of as-built conditions as needed, or as requested by PRE
- Bring DSA marked up check sets of drawings and specifications, corrected original drawings (tracings) and corrected master copy of the specifications including manually signed cover sheet
- Bring Test and Inspection list and documents required list
- Bring amending letters, geology reports, etc., as requested by comments
- Bring design and drafting aids as required
- Show to the PRE any changes or additions made to the drawings or specifications that were made after submission for DSA check

Additional calculations must be provided as required to substantiate any structural changes. All required calculations must be made available to the PRE at the backcheck appointment.

4. Back Check Process

Each detail or item marked with a red comment on the check set of drawings or specifications will be compared by the PRE and the design professional to corrected detail or item on the original drawings or specifications and to revised calculations where applicable.

If the corrected detail or item is acceptable, PRE will apply a large green pencil check mark over the red marked comment. If item is unacceptable, apply a green pencil mark in a circle around the red marked comment and request that the client provide additional information to mitigate the comment.

When all of the comments on a sheet of the drawings are checked off in green, a green check mark will be made in the lower right hand corner of the sheet at the sheet number box.

If the PRE determines that the design professional has not completed his corrective work:

- The PRE will quickly review the extent of the incomplete work with the design professional
- The PRE will inform the design professional that the corrections must be complete before back-check can continue
- The design professional may continue to complete the corrections on his own in the back-check room as space permits while the PRE returns to his desk to continue other work

Otherwise, the design professional may choose to make a future appointment to resume the back-check and return to his office to complete the corrections. This procedure is not meant to preclude minor drafting and calculation changes during back-check.

- A notice has been in use to warn the designer to be prepared at the back-check appointment.

  NOTICE TO THE DESIGN PROFESSIONAL:

  All plan review comments must be addressed in full prior to your back-check appointment. Questions and points of disagreements must be resolved prior to back check by fax addressed to the plan reviewer. The person or persons representing the design firm in the back check must be thoroughly familiar with the project and the plan review comments /corrections. The back check will be terminated when it is determined by the plan reviewer, with the concurrence of his/her DSA plan review supervisor, that more than three plan review items have not been addressed in full, or that new items have been added that require additional plan review, or that the representative of the design firm is not adequately familiar with the project to

address plan check comments. The next available backcheck appointment will be scheduled.

Any questions regarding this notice must be addressed to the DSA Regional Manager

When differences of opinion occur between PRE and the design professional:

- PRE should respectfully and logically explain the reasoning behind the comment
- The DSA plan review supervisor should be consulted if the disputed comment cannot be resolved
- The design professional may appeal any disputed comment to the next higher authority (see also memo Appeal Procedures)
- For differences of opinion concerning matters of engineering judgment and not a specific provision of the code, the judgment of the design professional should prevail.

5. Stamping Drawings and Specifications

Prior to Stamping:

- All comments must be checked off on drawings and specifications
- The design professionals must wet sign the plans and specifications
- T&I list and Documents Required List completed
- Amending letters, geological letters received
- Fire & Life Safety approval received
- Access Compliance approval received

DSA stamp will be applied to all drawings to be approved. DSA stamp is for identification purposes only. A letter signed by the Regional Manager grants approval of plans and specifications. Some architects may pre-print a blank DSA identification stamp on the drawings.

- PRE will initial, in ink, each stamp on each page of the drawings and on the specifications cover sheet

The project calculations shall not be stamped. Remind design professional that after DSA stamping:

- No changes may be made to drawings or specifications unless written DSA approval is obtained
- Changes may be approved as addenda, change orders, or as “revised plans." See section IV & V
- Unapproved changes void DSA approval of the plans and specifications
- Record set of drawings must be delivered to DSA within 14 days after the date of stamping the plans and specifications or the project may be voided as per Title 24, Part 1, Section 4-318

Disposition of Documents

- PRE completes final items such as back check date and project scope on Plan Check Worksheets
- PRE organizes the plan review file and places final calculation sets in file
- PRE turns in check set of plans and specification to DSA plan review supervisor
- PRE completes forms required by area business office to facilitate processing of documents such as the backcheck worksheet


BackCheck WS

IV. “Revised Plans” Checking Procedure

Where the design professional has made a DSA approved change on the previously stamped and approved drawings or specifications before the project is advertised for bids, a revision notation may be applied by DSA to the original stamp on these documents. This type of approval is often required where the project is revised to comply with current code requirements or put out for bid again.

- When a request is made for this type of approval, the PRE should discuss the extent of the revision with the DSA plan review supervisor before proceeding
- Method of reviewing and back-check is similar to procedures outlined previously

A worksheet should be prepared to indicate the extent of revisions. If the extent of the revision is minor and is clearly defined, it can be handled “over-the-counter." The design professional must submit a letter revising the scope of the application. Additional fees may be required.

- Mark “revised” above the original DSA stamp, initial and date

V. Addendum, Change Order, and Deferred Approval Review Procedure

An addendum is a change made to the DSA approved drawings or specifications before a contract is awarded. Also see “As revised” procedure above for changes made before advertising for bids. A change order is a change made to the DSA approved drawings or specifications after the contract has been awarded. A deferred approval represents a portion of the construction that cannot be fully detailed on the approved drawings because of variations in product design and manufacture. The approval of plans for such a portion may be deferred until the material suppliers are selected.

The addendum, change order and deferred approval worksheet, SSS 143-1, is used to route the particular item through the intra-office distribution system. Change orders and preliminary change orders will be routed to the field engineer and only rerouted to the original PRE when extensive reviews of calculations are required. Addenda are always routed to the original PRE.


SSS143-1

- Input Tracker data immediately on receipt of an addendum, change order or deferred approval as an assignment
- Checking of addenda, change orders and deferred approvals usually takes precedence over plan checking
- When a large number of items to be reviewed is received, its‘ impact on scheduling should be reviewed with the DSA plan review supervisor
- Reviewing is accomplished as described previously under Plan Review Procedure
- If back-check is required a corrected change order is submitted by mail. For large change orders that require extensive corrections a backcheck appointment may be scheduled as described previously
- Require signature of architect or engineer of record on documents before reviewing

Deferred approval items that are designed by engineers and/or consultants other than design professionals listed on the application are allowed provided that the architect listed on the project application completes the attached statement of acceptance:


Statement (psi)

1. Review, Approvals and Stamping

- Before approval, verify if fire & life safety and access compliance approvals are required
- For addenda and deferred approvals, the PRE indicates approval by completing, signing, and dating Form SSS 143-1. Disapproval of items is made by noting, "NONE" under “list of materials approved” on the form. Also, there is space to discuss the nature of the disapproval of the document under the comments section
- Stamping – After completion of Form SSS 143-1 by the PRE, or field engineer, all material is returned to the DSA business unit
- If approved, either the PRE, the field engineer or the business unit will stamp appropriate drawings and other documents
- The initials of the approving engineer shall be placed on the approval stamp
- Business unit will return material either approved or disapproved to the design professional and make appropriate data entries into Tracker

VI. Incremental Approvals

Projects may be submitted to the office in separate increments under the same application. An example of this would be the case where a site development package (increment #1) precedes the permanent building package (increment #2) which precedes the relocatable building package (Increment #3).

Plan review procedures for incremental submittals are the same as regular projects except that:

- The 'portion of scope' box is checked on the yellow Plan Check Worksheet for all increments up until the final increment. The 'entire scope shown above' box is checked for the final increment. Note that the full scope of the project is always shown in the 'Entire Scope of Project' field near the top of the form for all increments.

PCWorksheet

- Drawings that are included in more than one increment must be carefully coordinated so that instructions to the contractor(s) are clear and consistent
- Mark the increment number over the identification stamp at the back-check
- The scope of 'over-the-counter' projects (see Section VII below) shall not include more than three increments

VII. Over the Counter Reviews

Plan reviewers are scheduled on a rotating basis to handle over-the-counter (OTC) appointments that are primarily used for relocatable classroom building projects. The OTC review and approval process is intended to take place in the course of a one-hour appointment. The attached client handout describes the OTC process. Most of the administrative tasks for OTC projects are identical to regular projects. The reminder list includes a checklist for OTC relocatable plan reviews.


OTC process

The architect listed on the project application shall either stamp all drawings or shall provide the signed statement of acceptance.


Statement